

INDOMYRMA DASYPYX, NEW GENUS AND SPECIES,
A MYRMICINE ANT FROM PENINSULAR INDIA
(HYMENOPTERA: FORMICIDAE)

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ABSTRACT

A new myrmicine genus *Indomyrma* is raised for a single new species, *I. dasypyx*, from the Western Ghats of peninsular India. The new genus is close to *Dacatinops* (Malaysia to New Guinea), but lacks spongiform appendages of the waist segments found in the latter, and the male has peculiar, deformed antennal funiculi. Worker and queen have 11-merous antennae (3-merous club), male antennae 12-merous; palpi segmented 2.2. Larvae much like those of *Dacatinops*. Chromosomes $n=12$ metacentrics. Malpighian tubules 5 in all castes, both sexes, not cryptonephric. The ants nest in rotten wood in shady broadleaf forest at elevations of 650-1000m, and are priarily insectivorous, living in colonies of 10-500 workers.
KEY WORDS: Ants, Formicidae, Myrmicinae, India, chromosomes, Malpighian tubules, antennae.

INTRODUCTION

The species described below is an original. It is a typical myrmicine, but cannot be referred to any particular tribe of the currently chaotically organized subfamily. I have supplied as many character states for classification as are available under present standards. The genus appears to be a member of the morphocline leading from the *Myrmica* genus-group to *Dacatinops* (Brown and Wilson, 1957; Taylor, 1965), and in fact may be regarded as a *Dacatinops* precursor. This genus and species is described in honor of Prof. Jehoshua Kugler, of Tel Aviv University.

Indomyrma Brown new genus

Diagnosis, worker: Monomorphic myrmicine ant with 11-merous antennae and 3-merous antennal club, similar to *Dacatinops*, but with the following principal differences.

- (1) Spongiform appendages completely lacking (on petiole, postpetiole and base of gaster).
- (2) Petiole nodiform, with distinct anterior peduncle.

- (3) Antennal scrobes shallow and weakly demarcated, open to dorsal view.
- (4) Frontal lobes smaller and more mesally positioned, only narrowly separated.
- (5) Basal tergum of gaster (abdominal tergum IV), which takes up most of gaster, shallowly and closely, but distinctly foveolate throughout, with minute roughening between foveolae, opaque, basal longitudinal costulae not apparent.

Queen: Alate when virgin, differing from the worker in slightly larger size, much larger eyes, and the usual differences seen between female castes in the subfamily. Wing venation of the *Tetramorium* pattern, with forewing RS not reaching costa ("radial cell open"); hind wing narrow and with sharply rounded apex.

Male: typical myrmicine male, smaller than queen, with similar wing venation, but with aberrant 12-merous antennae having a strongly S-shaped curvature or kink near and beyond midlength, caused in large part by a deformity of antennomere VII, which has its basal half greatly narrowed and somewhat curved.

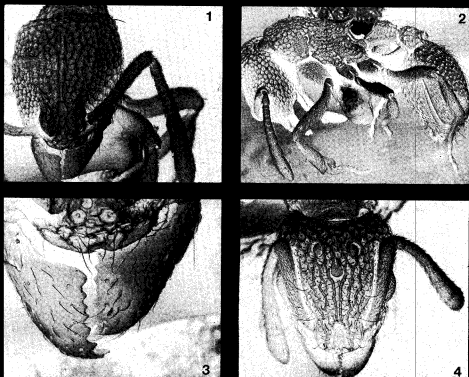
Genitalia essentially typical of small-sized "core" Myrmicinae, except for aedeagus, which is short and broad and has a deeply emarginate (bilobed) apex.

Larva: similar to that of *Dacetonops* (allowing for instar differences and small sample size of the material available).

FURTHER DESCRIPTION

Worker: head broad behind, narrowed anteriad, with convex sides in full-face view; posterior outline weakly concave in middle third, the posterolateral corners more rounded seen in dorsal view than in *Dacetonops*, but still with a narrow flange or "ear" as seen from side view. Eyes small but convex, with less than 12 (usually 8-10) distinct ommatidia (Fig. 5), situated a little anterior to midlength of head, ventral to ventral limit of scrobe.

Frontal lobes well developed, convex, and with rounded sides, but situated close together toward median line of head, separated by narrow, impressed, posteromedian extension of clypeus with adjacent, sunken, long-oval shining frontal area, which together form a keyhole-shaped frontal cleft between lobes. Lobes pinched in slightly caudad, but continued as fairly distinct but obtuse frontal carinae, that diverge gently toward posterior corners of head where they fade out at about posterior tenth of HL after forming dorsal margins of shallow scrobes much less distinct than those of *Dacetonops*. Frontal lobes rounded anteriad and situated well back from anterior margin of clypeus. Clypeal shield narrower than head across mandibular insertions, but long anteroposteriorly; median portion just in front of frontal lobes convex, but falling off steeply to sides and dropping anteriad to a narrow apron or marginal lamina that is strongly convex in outline, but with a small median notch (Figs. 1,3). Clypeal apron barely covers basal borders of fully closed mandibles. Raised median portion of clypeus not clearly carinate, but its lateral margins fall off so steeply on each side that the angles or edges so formed, diverging in wide curves around the anterior margins of the antennal fossae, may be taken as the homologs of the twin divergent carinae in other myrmicine genera (e.g., *Rogeria*), and perhaps even of the antefossal ridges



Figs. 1-4. *Indomyrma dasypyga*, n. sp. worker and queen. 1. Worker head, dorsal, nearly full-face view, electron shadow on cranium to left, X 42. 2. Worker, slightly oblique side view, X 30. 3. Worker, dorsal view detail of clypeus and mandibles, X 116. 4. Queen head, dorsal view, tilted slightly forward to show sculptural detail, X 49, scanning electron micrographs.

characterizing Tetramoriini and some primitive *Myrmica* species. It should be recalled that similar carinae bound the median clypeal lobe of ectatommine ponerines such as certain *Proceratium*.

Mandibles robust, triangular, closing together fully, masticatory borders straight, overlapping slightly apicad when closed; bases narrowed and gently incurved; basal borders gently convex, distinct from masticatory borders, hidden beneath clypeal apron at full closure; masticatory borders each with 9 (8-10) separate teeth, the apical tooth largest and sharpest, followed basad by 2 teeth decreasing in size, then by 6 (5-7) irregular denticles occupying the rest of the border. Lateral mandibular border, as seen in full-face view of head, convex at base, straight to very feebly concave in the middle half of its course, then convex to end of apical tooth.

Labrum wider than long, apical margin broadly emarginate (or bilobed), extensor surface weakly convex, shining. Palpi short, segmented 2, 2.

Antennae with stout, weakly sigmoidal scapes that broaden gradually from base to apex, with 11 segments total; pedicel (II) about equal to III+IV+V; III-VI broader than long; VII and VIII slightly longer than broad; IX, X and XI much longer than broader, together forming a club longer than remainder of funiculus. Club 3-merous; the preceding segment is slightly enlarged, and could be considered as a fourth segment

of the club, but this would be stretching a point.

Alitrunk well represented by figs. 2, 6 and 9, so the description here will be limited to emphasis on important features and clarification of those that may be obscure in the figures. First to be noted is the compact, sutureless dorsal surface, evenly convex from the distinct anterodorsal pronotal margin (flanked by subacute humeral angles) to the shallow but distinct metanotal groove, which is not clearly shown in the photographs. Behind metanotal groove, anterior half of propodeal dorsum convex, after which posterior half becomes concave onto bases of upwardly inclined propodeal teeth, which themselves have prevalingly upcurved dorsal margins and apices, so that dorsal propodeal outline as seen from the side is distinctly sigmoidal. These features, as well as the strong, oblique pleural groove indicating meso-metathoracic suture, are somewhat obscure in the figures. Propodeal spiracles prominent, situated very close to declivitous margins, directly below tooth bases, their openings facing almost as much caudad as laterad.

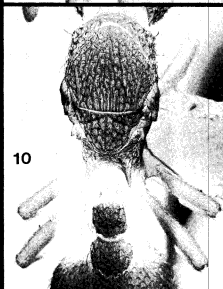
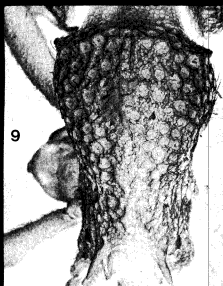
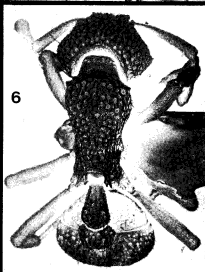
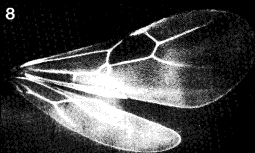
Metapleural gland bulla moderately distinct, meatus small and obscure, but with two curved, longitudinal sulci leading forward along lower metapleuron (Fig. 2). Propodeal declivity distinct, higher than wide, margined above by one or two curved, transverse costae connecting the two teeth, and by thin, sharp lateral margins that merge into the metapleural lobes (inferior propodeal plates, fig. 2); declivitous surface weakly shining, very finely reticulate-punctulate, becoming smooth and shining ventrad.

Petiole with a short but distinct anterior peduncle and a subcubical node; peduncle broadening and thickening caudad to meet node (Figs. 3, 6) and obscurely marginate above on each side; anteroventrad, the anterior peduncle bears a distinct, weakly curved, digitiform, subpetiolar process directed obliquely cephalad between coxae, and visible when gaster with the two waist segments is raised slightly. Petiolar node highest near anterior angle, then falling slightly through a convex surface to a distinct but narrow posterior collar. Viewed from above, petiolar node nearly square, about as wide behind as it is long, but very slightly narrower cephalad; anterior margin straight to feebly convex, depending on exact angle of view, and anterior corners almost rectangular in direct dorsal view, which is not the view in fig. 6. A minor feature is the presence of a pair of shallow, fine, converging sulci on posterodorsal surface of node, not visible in figures.

Postpetiole shorter than petiole, but distinctly broader, and broader than its own length; dorsum and sides strongly rounded.

Gaster broader than deep (about 7:5), and basal tergum (true T4) covering almost 0.9 of its length in dorsal view. From dorsal view also, middle section of anterior margin straight, or even feebly concave, so that basal outline appears slightly shouldered on each side. Lateral suture not arched basad, running well below bulging overhang of tergum along sides of gaster. Apical segments (A7 and succeeding ones) forming a small, blunt cone, directed slightly downward as well as caudad.

Figs. 5-10. *Indomyrma dasypyx* n. sp. 5. Eye of worker, X 82. 6. Dorsal view of worker, X 41. 7. Dorsal view of dealate queen, X 26. 8. Right wings of male, X 20. 9. Dorsal view of worker alitrunk, X 96. 10. Dorsal view of alitrunk, waist and gastric base, X 45. All except 8 are scanning electron micrographs.



Sting (worker and queen) not dissected, described only from dried specimens with shaft and part of sting bulb, plus gonostyli, exposed. Sting shaft long and slender, almost straight distad of the slightly arched bulb, almost imperceptibly upturned apicad, the visible parts resembling figs. 75, 76 (*Vollenhovia*), fig. 92 ("*Rogeria*") or figs. 146, 147 (*Stenamma*) in Kugler 1978. Gonostylus long and gradually tapered to an acute apex; probably bipartite, although the articulation, if it exists, is nearer to the base than the apex. It will be interesting to see the results of a properly detailed study of the sting structures.

Legs unremarkable; femora and tibiae robust, hind tibia nearly 2 X as wide as its thickest point as its basitarsus; tibiae II and III spurless at apices. Tarsomeres II-V taken together slightly shorter than I, and each taken separately slightly longer than broad. Tarsal claws slender, simple; arolium undeveloped, replaced by a pair of short, slender, erect hairs.

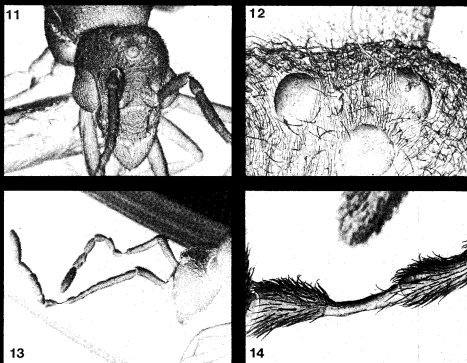
Sculpture distinctive, opaque or neary so over most of body, consisting mainly of distinct, round, centrally tuberculate and piligerous foveolae (Figs. 1, 2, 3, 6, 9), crowded and subcontiguous on both dorsal and ventral surfaces of head, especially on anterior and lateral aspects, on dorsum of alitrunk, nodes and gastric tergum I (more shallow and with partly shining interspaces here apicad). On dorsum of head, foveolar interspaces form 8-9 slightly vermiculate longitudinal costae, including frontal carinae, between antennal scrobes; middle costae very distinct. Elsewhere, foveolar interspaces, alitrunkal pleura, antennae, legs and sides of nodes finely and densely punctulate to reticulopunctulate. Gastric interspaces finely rugulose. Mandibles smooth and shining, with scattered fine punctures.

Pilosity consisting of widely distributed, moderately abundant, short, decumbent and subdecumbent setae; this vestiture denser, finer, shorter and more nearly appressed on antennae and legs. Setae fine and sparse on clypeus and mandibles. Longer, fine, curved, erect and suberect hairs, mostly 0.05-0.18 mm long, tend to arise from constant, bilateral positions on head, alitrunk and nodes: 2 pairs from median clypeal shield, 1 pair from frontal lobes, 3 pairs from on or just mesad of frontal carinae at different distances from front to rear, 1 pair (often lost) from near posterior corners of head, a humeral pair, plus about 6 more pairs on pronotal disc and mesonotal dorsum; 2 pairs suberect marking dorsal corners of petiolar node, 3 pairs on postpetiolar tergum, inclined caudad. Gastric tergum with many of these longer hairs, curved sharply caudad, and gastric sternum with similar but shorter hairs.

Color brownish red; appendages and mandibles dull yellowish; some specimens darker, mahogany approaching black, and appearing black to naked eye.

Queen: See above, under Diagnosis, and below, in the species description, and figs. 4, 7, 10.

Male: Alate and large-eyed, of usual myrmicine habitus, except for antennae, which are 12-merous and aberrant, as described below and shown in figs. 13 and 14. Head without eyes slightly longer than broad, broad behind and broadly rounded in dorsal-view outline; tapered anteriad in front of eyes, convergent sides continued in outline by the closed, narrowly subtriangular, converging mandibles, opposable and with basal margins convex and broadly continuous with convex masticatory margins, which are cultrate and end in a small, acute tooth at each apex. Mandibular shafts bent slightly mesad near their insertions.



Figs. 11-14. *Indomyrma dasyptyx* n. sp., male, scanning electron micrographs. 11. Head in oblique dorsal view, X 55. 12. Upper vertex with ocelli, oblique dorsal view, X 208. 13. Head with partly extended antennae, dorsolateral view, X 37. 14. Detail of seventh and apex of sixth antennal segments, X 212.

Frontal lobes small (Fig. 11); frontal area small and indistinct; a shallow median frontal line or sulcus leads back toward median ocellus; scrobes not developed. Clypeus convex, broadly triangular, narrowed posteriad and inserted between frontal lobes, but broadly and very weakly convex apicad. Labrum broad, with a weakly convex, shining dorsal surface and bilobed at apex, found extended in most specimens, filling most of the otherwise empty space between closed mandibles.

Under-mouthparts not dissected in male, but the palpi are short, apparently dimerous and similar to those of the female castes.

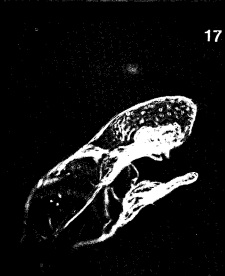
Antennae (Fig. 13) slender, contorted in about middle third of length, antennomeres mainly cylindrical basad, III long, subequal to IV-IV together. Apical segment (XII) long, fusiform, slightly incrassate; antennomere VII (Fig. 14) of a peculiar shape, with very slender, curved, stalked portion basad, widening to a more normal thickness at apex. This and the more normally formed, but curved, succeeding (VIII-XI) antennomeres together form a semirigid, more or less S-shaped mid section of the antennae, including the sharply narrowed VII, the function of which is seen in the living colony to serve as a handle by means of which the passive, folded male adult or pupa (pharate adult) is carried in the mandibles of workers. This structure of the antennae is uniform as seen in all males in at least two different colony series from different localities, and it appears to be naturally preformed in the course of



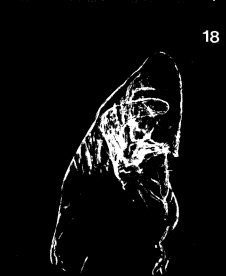
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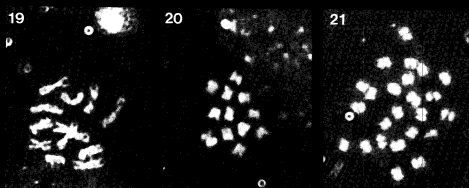


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Figs. 15-18. *Indomydrma dasypyx* n. sp., dissection of male genitalia, cleared in KOH and Clorox.
 15. Genital capsule undisseminated, ventral view. 16. Aedeagus, left valve, lateral view. 17. Left paramere and volsella, oblique ventral view. 18. Same, lateral view, ventral side to right. All X 182.

development, not just the secondary result of pressure from worker mandibles.

Pronotum inverted U-shaped around the inflated mesonotum, which bears distinct, impressed, convergent notauli that almost, but do not quite, meet in a V cuudad. Parapsidal furrows present as fine impressed lines. Scutellum and the much smaller metanotum both distinct, convex, and bulging, but only modestly so. Propodeum with steeply sloping dorsal surface nearly twice as long as declivity, and



Figs. 19-21. *Indomyrma dasypyx* n. sp., chromosome complements. 19. Spread from male pink-eye pupal testis, about 1200 X, haploid. 20. Spread from male prepupal brain, about 1600 X haploid. 21. Spread from queen prepupal brain, about 1600 X, diploid.

nearly flat, separated from declivity by obtuse angles representing propodeal teeth; declivity prevailing weakly concave in both lateral and dorsal views, with blunt, submarginate lateral boundaries ending ventrad in rounded inferior propodeal plates or flanges. Propodeal spiracle near the middle of the lateral propodeal face, well away from declivity.

Petiole long and low; node with low, gently sloping anterior and posterior surfaces, and thus indistinct in side view, but in dorsal view, node broader than long. Subpetiolar process represented in the male only by a minute, subangular terminus of the median sternal carina. Postpetiole only about half as long as petiole, but slightly wider, with strongly rounded dorsum and sides of node; briefly pedunculate cephalad, and broader, but sharply constricted caudad.

Gaster broader than high, without shoulders basad, and sides evenly convex throughout; basal tergum constituting nearly 3/4 of total gastric length. Legs slender, unremarkable, the mid and hind tibiae spurless; tarsal claws slender, weakly curved; arolia absent, replaced on each pretarsus by a pair of fine, short, erect hairs. Basitarsus long and slender, especially on hind leg (average L about 0.55 mm, hind tibia L 0.50 mm).

Wings like those of queen, but a little smaller (average forewing L 2.7 mm) and with discoidal cell more nearly triangular (narrower at anterior apex, due to shorter RS + M); veins brownish, and membrane sown densely with minute, brown microtrichia. Hind wing narrow; costal margin with 4 submarginal hamuli, as in queen.

Genitalia completely retractile, the dissected capsule shown in figs. 15-18. Distinctive feature is the deeply notched ventral margin of the paramere (on right side in fig. 18, and especially the short, broad, apically emarginate aedeagus (Fig. 16)). The paramere also has some sort of mesal process near its apical quarter, but the details are still unclear (Fig. 17).

Except for the smooth and shining (micropunctulate) gaster and labrum, body and appendage sculpture prevailing a very fine, shallow, matt, reticulo-punctuation, passing into peculiar, "deep" striolation on vertex (Fig. 12), and variably overlain by fine, spaced costulation on propodeum — vertical on sides, tranverse above on anterior dorsum.

Most of dorsal body surfaces, appendages, and undersides of head and gaster covered by copious, short, fine, appressed to decumbent, but mostly inconspicuous pubescence. Longer, but still mostly short, fine, sparsely arranged hairs on clypeus, vertex, underside of head, dorsal surfaces of pronotum and pterothorax, paired on sides of petiole and postpetiole and postpetiolar tergum, and gastric apex.

Color brown, lighter on alitruncal pleura, mandibles and appendages, darker above on alitrunk and gaster; head very dark brown or piceous to nearly black.

Malpighian tubules 5 in all castes, long, not cryptonephric (sample N = 1 queen, 4 males, 2 workers).

Karyotype haploid number is 12 metacentric chromosomes, counted from 11 spreads from male pupal testes (Fig. 19), 15 spreads from prepupal brain of another male (Fig. 20) and two diploid spreads from the brain of a queen prepupa (Fig. 21), all from the cultured *Peria Reserve* (M-237) colony. The slides were made by Dr. Ross Crozier and myself, and were stained, read and photographed by myself later.

Mature worker larva: L through spiracles about 2.2 mm, straightline L 2.0 mm. Profile aphaenogastroid (G.C. and J. Wheeler 1976: 76), but the body constriction weakly marked. Considering that this is a mature larva, and that the larva previously described for *Dacatinops* (G.E. and J. Wheeler 1957) was only a small one of an earlier instar, the correspondences between them in head and body form, mouthparts, and pilosity are very close. I was not able to distinguish the antennae in my preparations, and I am not sure about the number and types of sensilla present on the cephalic appendages, but in other characters discussed by the Wheelers, the similarity between *Indomyrma* and *Dacatinops cibdela* larvae is nearly complete. I would mention as minor differences that the mandibles of *Indomyrma* are slightly stouter, especially basad, and that there are a few reclinate spinules on their inner (mesal) surfaces on the basal half. The bilobed labrum in *Indomyrma* is 3.5X as broad as long. Some of the head hairs, bifid at the apex, are seen under magnifications of 400X or more to be finely denticulate or twigged within the split apices. The ventral welts of abdominal somites II and III in *Dacatinops* are much less pronounced in these older *Indomyrma* larvae. The anchor-tipped hairs in transverse rows of 4 each across the dorsal somites are longer and have kinkier basal shafts than in the young *Dacatinops* larva. On the basis of the evidence available, I do not see how *Dacatinops* and *Indomyrma* can be separated on larval characters.

The phylogenetic connections of the larvae of these two genera among the rest of the Myrmicinae are much less clear, largely due to the still chaotic classification of myrmicine tribes and genera, currently the focus of much attention by myrmecologists. The situation is slowly being improved by the investigation of many hitherto "missing" characters, particularly those of the larvae and the sexual castes. Meanwhile, we can make the guess that *Indomyrma* comes nearest to some of the less strongly derived myrmicines: the neotropical ("true") *Rogeria* would be good candidates for comparison on the basis of larvae as well as adults.

Type species, monobasic and by present designation:

Indomyrma dasypyx Brown new species

Worker, holotype (see Appendix for abbreviation explanations): TL 3.4, HL 0.80, HW 0.67 (CI 84), ML 0.21 (MI 26), SL 0.56 (SI 84), EL 0.05, WL 0.97, hind

femur L 0.65, hind tibia L 0.50 mm.

Worker, paratypes: TL 3.3-3.6, HL 0.70-0.83, HW 0.58-0.72 (CI 83-87), ML 0.18-0.22 (MI 26-27), SL 0.49-0.57 (SI 85-79), EL 0.03-0.05, WL 0.86-1.00 mm.

Habitus, sculpture and pilosity are for the most part represented well in figs. 1-3, 6 and 9, plus the generic characterization, above.

Queen, paratypes (alate and dealate): TL 3.8-4.0, HL 0.76-0.80, HW 0.66-0.70 (CI 87-88), ML 0.23 (MI 29-30), SL 0.55-0.56 (SI 80-83), EL 0.19-0.21, WL 1.10-1.12, forewing L 3.2-3.4 mm.

Aside from the more robust stature and usual full-queen differences from the workers (Figs. 4, 7, 10), the queen has slightly more distinct interfoveolar, longitudinal costae on the middorsal head, and some also on the mesonotum. Suberect hairs more numerous, especially on pterothoracic notum and gastric tergum. Color of fully pigmented individuals dark brownish red, darker on dorsum of head and alitrunk, where it is mahogany approaching black. Appendages yellowish brown.

Male, paratypes: HW (without eyes) 0.47-0.51 mm in 8 specimens measured. One representative specimen had TL 3.1, HL 0.57, HW 0.50, ML 0.16, SL 0.30, EL 0.26, WL 0.98, forewing L 2.8 mm.

MATERIAL EXAMINED: Types: Holotype worker, from nest no. M-242 (see below) deposited with some paratypes in the Museum of Comparative Zoology at Harvard University, Cambridge, Massachusetts 02138, USA. Additional paratypes (all adult castes) in British Museum (Natural History), London; Cornell University Insect Collection, Ithaca; Australian National Insect Collection, Canberra; Zoological Survey of India, Calcutta, and California Academy of Sciences, San Francisco.

Localities, all in peninsular India: KERALA State (Western Ghats), Cannanore District, Peria Forest Reserve, nests all in rotten logs in disturbed semideciduous forest at about 900 m elevation; M-242, M-237, M-238, 4-5 April 1969, A.B. Soans and W.L. Brown, Jr. leg. Kottiyoor in Wynaad Taluk, rotten wood in evergreen forest at about 650 m, M-190, 7 April 1969, Soans and Brown leg.

MYSORE State: 8 mi. (13 km) NE of Mercara, 1000 m, 22 Feb. 1962, E.S. Ross and D. Q. Cavagnaro leg.

OBSERVATIONS

Colonies from Kerala were estimated to contain between 100 and 500 workers plus copious brood in all stages of development. At the time of collection, all Kerala (April) nests contained some sexual brood, both males and queens together. Two colonies, M-238 and M-190, were kept alive for observation and rearing (Crozier's slide notation AABW-1 refers to nest M-238), and these were still eclosing a few winged forms in mid-May 1969 in a plaster-bottomed observation nest in the laboratory. The prepupal and male pupal tissue preparations for karyotyping were made during this period by Dr. Ross Crozier and myself, using his acetic acid, air-drying method (modified slightly; see Imai et al. 1977).

In the artificial nests, the ants were rather sluggish, and many entered into a death-feigning "pupal" pose upon the slightest physical disturbance. The workers and nest queens usually clustered thickly on the single, compact brood pile, virtually hiding

it from view, in the manner of *Myrmecina* and some other small myrmicines, but in their natural nests in the field in India, the ants were found to be somewhat more dispersed in several definite chambers within good-sized pieces of rotten wood.

Within the artificial nest, *Indomyrma* workers accepted freshly killed, dismembered, housefly and scarabaeid beetle larvae, and live but disabled adult chironomids and mosquitoes, and fed them to at least the larger ant larvae directly. No ants were attracted to small droplets of diluted honey placed on tiny squares of waxpaper in one artificial nest, but these trials were very limited, and should not be taken as conclusive that the ants always ignore sweet substances. One peculiar habit, already alluded to in the descriptive section above, is the worker transport of callow and fully pigmented adult males by means of the "antennal handles." The peculiarly deformed male antennae (Figs. 13, 14) together form a curved, sublyriform handle or rack extending from the head forward. These are grasped in the worker mandibles, whereupon the transported male folds up his legs and remains motionless while he is being carried backwards, his rigid body often slanting upwards, to the new place where he will be set down. The worker mandibles appear to close upon that part of the male antennae where the most conspicuous modification (constriction) occurs (Fig. 14).

The four Kerala colonies observed first-hand appeared to be monogynous, that is, with only one dealate, deeply pigmented queen in each nest, but of course other functional queens may have escaped observation or capture during the confusion of collection.

DISCUSSION

As has already been indicated, *Indomyrma* is close to *Dacatinops*, and perhaps represents the ancestral stock of the latter. *Dacatinops* is known from two described species, *D. cibdela* from New Guinea (Brown and Wilson, 1957) and *D. concinna* from Borneo (Taylor, 1965), plus two undescribed species from the East Indies now in collections. *D. concinna*, first taken in Sarawak, has now also been found at the opposite corner of Borneo, in the forest west of Batulitjin, SW Kalimantan, in rotten wood (W.L. Brown, Jr. leg.). It thus appears that *Dacatinops* is widespread in the Indo-Australian region, and is not as rare as the recency of its discovery may suggest.

The relationship between *Dacatinops* and *Indomyrma* is easier to discern than is the position of both genera with regard to other stocks within the Myrmicinae. In fact, very little of value can be added to the discussion of Brown and Wilson (1957:7). The genus *Rogeria*, currently being revised by Charles Kugler, has some points of similarity with *Indomyrma*, but we need to know much more about *Rogeria* males before a full comparison can be made. The Indo-Australian genus *Lordomyrma* has been compared, but this genus has 12-merous antennae in the worker, and the propodeal spiracle is situated near the middle of the side wall of the propodeum. Palpal formula of at least one (undescribed) *Lordomyrma* species is 3,2, and the males accompanying this worker have normal, 13-merous antennae and a very different alitruncal form.

Tetramorium and *Leptothorax* also differ by significant characters, including more palpal segments and fewer mandibular teeth. No doubt the relationships of *Indomyrma* will become clearer as the other myrmicine genera are systematically characterized.

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REFERENCES

- Brown, W.L., Jr. and Wilson, E.O. 1957. *Dacetinops*, a new ant genus from New Guinea. *Breviora*, Museum of Comparative Zoology, Cambridge, Massachusetts, 77:1-7.
- Imai, H.T., Crozier, R.H., and Taylor, R.W. 1977. Karyotype evolution in Australian ants. *Chromosoma*, Berlin, 59:341-393.
- Kugler, C. 1978. A comparative study of the myrmicine sting apparatus (Hymenoptera, Formicidae). *Studia Entomologica*, Petropolis, Brazil (n.s.) 20:413-458.
- Taylor, R.W. 1965. A new species of the ant genus *Dacetinops* from Sarawak. *Breviora*, Museum of Comparative Zoology, Cambridge, Massachusetts, 273: -
- Wheeler, G.C. and J. 1957. The larva of the ant genus *Dacetinops* Brown and Wilson. *Breviora*, Museum of Comparative Zoology, Cambridge, Massachusetts, 78:1-4.
- Wheeler, G.C. and J. 1976. Ant larvae: review and synthesis. *Memoirs of the Entomological Society of Washington* 7:v + 108 pp.

APPENDIX

Abbreviations for measurements are as follows. L is length, W is transverse width. TL is total axial length of body, measured part by part, including closed mandibles, but excluding extruded sting or genital capsule. HL is head length in full-face dorsal view, including posterior lobes and all of clypeus. HW is head width, normally excluding eyes. CI is cephalic index, or $HW \times 100/HL$. ML is the distance to which the closed mandibles project beyond the free clypeal margin. MI is $ML \times 100/HL$. SL is scape length, excluding radicle. SI, or scape index, is $SL \times 100/HW$. EL is greatest diameter of compound eye. WL is length of alitrunk, measuring from anterior face of pronotum to tips of metapleural lobes.